CLAIMS

1. Method for the estimation of the transfer function of at least one transmission channel in a receiving system for telecommunications networks through the computation by means of an interpolation algorithm of a plurality of channel coefficients comprised between two groups of known channel coefficients, each channel coefficient being associated to an integer value of the abscissa on a time axis characterised in that the computation of said plurality of channel coefficients is carried out by repeatedly applying an interpolation algorithm capable of calculating an intermediate point (Z, f(Z)) between a first extreme and a second extreme of a defined interval, said first extreme being formed by two known points and said second extreme being formed by at least one known point, said intermediate point having as abscissa (Z) the abscissa value of the mean point between the points defining said interval rounded off to the integer closest to said first extreme, and having as ordinate (f(Z)) the arithmetic average between the ordinate of the known point of said second extreme and the ordinate of a point, chosen between two known points of said first extreme, having a distance from said intermediate point, on said time axis, equal to the distance between said intermediate point and the known point of said second extreme.

2. Method according to claim 1, wherein said channel coefficients to be calculated are comprised between a first known channel coefficient, of abscissa A, corresponding to a last pilot symbol of a current slot (L) and a second known channel coefficient, of abscissa B, corresponding to a first pilot symbol of a slot (L+1) subsequent to said current slot, being additionally known a third channel coefficient, of abscissa A-1, on the left-hand of said first channel coefficient of abscissa A, and the computation of said

channel coefficients is carried out through the following steps:

a) repeatedly applying in a recursive manner said interpolation algorithm in the interval defined by said known channel coefficients of abscissa A and B, by carrying out a first iteration in which a first intermediate coefficient (of abscissa C) is calculated; and by performing the subsequent iterations of the same algorithm in sub-intervals, defined each time on the left-hand by said known channel coefficient of abscissa A and on the right-hand by the intermediate coefficient, calculated in the preceding iteration, until the abscissa point A+1 is reached and computed;

b) searching, by increasing abscissas, for a first point, still to be calculated, on the right-hand of the last intermediate coefficient calculated; defining as extremes of a new application interval of said interpolation algorithm, the first known left-hand point and the first known right-hand point with respect to said point still to be calculated; and further applying, in a recursive manner, said interpolation algorithm to said new interval, by carrying out subsequent iteration of the same algorithm in sub-intervals defined from time to time by the intermediate coefficient calculated in the preceding iteration, until the point immediately adjacent to the left-hand extreme of said new interval is reached and calculated;

c) repeating step b) until the channel coefficient associated to the value of abscissa B-1 is calculated.

3. Method according to claim 2, wherein each slot contains three pilot symbols (0, 1, 2), said first known channel coefficient of abscissa A is the coefficient $C(2)=C_I(2)+C_Q(2)$ corresponding to the last pilot symbol (2) of the current slot (L), said second known channel coefficient of abscissa B is the coefficient $C(10)=C_I(10)+C_Q(10)$ corresponding to the first pilot symbol (10) of a subsequent slot (L+1), and said

third known channel coefficient of abscissa A-1 is the coefficient $C(1)=C_I(1)+C_Q(1)$ corresponding to the last but one pilot symbol (1) of the current slot (L) and the computation of channel coefficients $C(k)=C_I(k)+C_Q(k)$, with k=3..9, is performed according to the following sequence:

$C_I(6)=[C_I(2)+C_I(10)]/2$; $C_Q(6)=[C_Q(2)+C_Q(10)]/2$;

$C_I(4)=[C_I(2)+C_I(6)]/2$; $C_Q(4)=[C_Q(2)+C_Q(6)]/2$;

$C_I(3)=[C_I(2)+C_I(4)]/2$; $C_Q(3)=[C_Q(2)+C_Q(4)]/2$;

$C_I(5)=[C_I(4)+C_I(6)]/2$; $C_Q(5)=[C_Q(4)+C_Q(6)]/2$;

$C_I(8)=[C_I(6)+C_I(10)]/2$; $C_Q(8)=[C_Q(6)+C_Q(10)]/2$;

$C_I(7)=[C_I(6)+C_I(8)]/2$; $C_Q(7)=[C_Q(6)+C_Q(8)]/2$;

$C_I(9)=[C_I(8)+C_I(10)]/2$; $C_Q(9)=[C_Q(8)+C_Q(10)]/2$.

4. Method according to claim 2, wherein each slot contains four pilot symbols (0, 1, 2, 3), said first known channel coefficient of abscissa A is the coefficient $C(3)=C_I(3)+C_Q(3)$ corresponding to the last pilot symbol (3) of the current slot (L), said second known channel coefficient of abscissa B is the coefficient $C(10)=C_I(10)+C_Q(10)$ corresponding to the first pilot symbol (10) of a subsequent slot (L+1), and said third known channel coefficient of abscissa A-1 is the coefficient $C(2)=C_I(2)+C_Q(2)$ corresponding to the last but one pilot symbol (2) of the current slot (L), and the computation of the channel coefficients $C(k)=C_I(k)+C_Q(k)$, with k=4..9, is performed according to the following sequence:

$C_I(6)=[C_I(2)+C_I(10)]/2$; $C_Q(6)=[C_Q(2)+C_Q(10)]/2$;

$C_I(4)=[C_I(2)+C_I(6)]/2$; $C_Q(4)=[C_Q(2)+C_Q(6)]/2$;

$C_I(5)=[C_I(4)+C_I(6)]/2$; $C_Q(5)=[C_Q(4)+C_Q(6)]/2$;

$C_I(8)=[C_I(6)+C_I(10)]/2$; $C_Q(8)=[C_Q(6)+C_Q(10)]/2$;

$C_I(7)=[C_I(6)+C_I(8)]/2$; $C_Q(7)=[C_Q(6)+C_Q(8)]/2$;

$C_I(9)=[C_I(8)+C_I(10)]/2$; $C_Q(9)=[C_Q(8)+C_Q(10)]/2$.

5. Method according to claim 2, wherein each slot contains five pilot symbols (0, 1, 2, 3, 4), said first known channel coefficient of abscissa A is the coefficient $C(4)=C_I(4)+C_Q(4)$

corresponding to the last pilot symbol (4) of current slot (L), said second known channel coefficient of abscissa B is the coefficient $C(10)=C_I(10)+C_Q(10)$ corresponding to the first pilot symbol (10) of a subsequent slot (L+1), and said third known channel coefficient of abscissa A-1 is the coefficient $C(3)=C_I(3)+C_Q(3)$ corresponding to the last but one pilot symbol (3) of the current slot (L), and the computation of the channel coefficients $C(k)=C_I(k)+C_Q(k)$, with k=5..9, is performed according to following sequence:

$C_I(7)=[C_I(4)+C_I(10)]/2$; $C_Q(7)=[C_Q(4)+C_Q(10)]/2$;

$C_I(5)=[C_I(3)+C_I(7)]/2$; $C_Q(5)=[C_Q(3)+C_Q(7)]/2$;

$C_I(6)=[C_I(5)+C_I(7)]/2$; $C_Q(6)=[C_Q(5)+C_Q(7)]/2$;

$C_I(8)=[C_I(6)+C_I(10)]/2$; $C_Q(8)=[C_Q(6)+C_Q(10)]/2$;

$C_I(9)=[C_I(8)+C_I(10)]/2$; $C_Q(9)=[C_Q(8)+C_Q(10)]/2$.

6. Method according to claim 2, wherein each slot contains six pilot symbols (0, 1, 2, 3, 4, 5), said first known channel coefficient of abscissa A is the coefficient $C(5)=C_I(5)+C_Q(5)$ corresponding to the last pilot symbol (5) of the current slot (L), said second known channel coefficient of abscissa B is the coefficient $C(10)=C_I(10)+C_Q(10)$ corresponding to the first pilot symbol (10) of a subsequent slot (L+1), and said third known channel coefficient of abscissa A-1 is the coefficient $C(4)=C_I(4)+C_Q(4)$ corresponding to the last but one pilot symbol (4) of the current slot (L), and the computation of the channel coefficients $C(k)=C_I(k)+C_Q(k)$, with k=6..9, is performed according to following sequence:

$C_I(7)=[C_I(4)+C_I(10)]/2$; $C_Q(7)=[C_Q(4)+C_Q(10)]/2$;

$C_I(6)=[C_I(5)+C_I(7)]/2$; $C_Q(6)=[C_Q(5)+C_Q(7)]/2$;

$C_I(8)=[C_I(6)+C_I(10)]/2$; $C_Q(8)=[C_Q(6)+C_Q(10)]/2$;

$C_I(9)=[C_I(8)+C_I(10)]/2$; $C_Q(9)=[C_Q(8)+C_Q(10)]/2$.

7. Method according to claim 2, wherein each slot contains seven pilot symbols (0, 1, 2, 3, 4, 5, 6), said first known channel coefficient of abscissa A is the coefficient

$C(6)=C_I(6)+C_Q(6)$ corresponding to the last pilot symbol (6) of the current slot (L), said second known channel coefficient is the coefficient $C(10)=C_I(10)+C_Q(10)$ corresponding to the first pilot symbol (10) of a subsequent slot (L+1), and said third known channel coefficient of abscissa A-1 is the coefficient $C(5)=C_I(5)+C_Q(5)$ corresponding to the last but one pilot symbol (5) of the current slot (L), and the computation of the channel coefficients $C(k)=C_I(k)+C_Q(k)$, with k=7..9, is performed following the sequence:

$C_I(8)=[C_I(6)+C_I(10)]/2$; $C_Q(8)=[C_Q(6)+C_Q(10)]/2$;

$C_I(7)=[C_I(6)+C_I(8)]/2$; $C_Q(7)=[C_Q(6)+C_Q(8)]/2$;

$C_I(9)=[C_I(8)+C_I(10)]/2$; $C_Q(9)=[C_Q(8)+C_Q(10)]/2$.

8. Method according to claim 2, wherein each slot contains eight pilot symbols (0, 1, 2, 3, 4, 5, 6, 7), said first known channel coefficient of abscissa A is the coefficient $C(7)=C_I(7)+C_Q(7)$ corresponding to the last pilot symbol (7) of the current slot (L), said second known channel coefficient of abscissa B is the coefficient $C(10)=C_I(10)+C_Q(10)$ corresponding to the first pilot symbol (10) of a subsequent slot (L+1), and said third known channel coefficient of abscissa A-1 is the coefficient $C(6)=C_I(6)+C_Q(6)$ corresponding to the last but one pilot symbol (6) of the current slot (L), and the computation of the channel coefficients $C(k)=C_I(k)+C_Q(k)$, with k=8, 9, is performed according to the sequence:

$C_I(8)=[C_I(6)+C_I(10)]/2$; $C_Q(8)=[C_Q(6)+C_Q(10)]/2$;

$C_I(9)=[C_I(8)+C_I(10)]/2$; $C_Q(9)=[C_Q(8)+C_Q(10)]/2$.

9. Method according to claim 1, wherein said channel coefficients to be calculated are comprised between a first known channel coefficient of abscissa A, corresponding to a last pilot symbol of a current slot (L), and a second known channel coefficient of abscissa B, corresponding to a first pilot symbol of a slot (L+1) subsequent to said current slot,

being additionally known a third channel coefficient of abscissa B+1, on the right hand of said first channel coefficient of abscissa B, and the computation of said channel coefficients is performed through the steps of:

a) repeatedly applying, in a recursive manner, said interpolation algorithm in the interval defined by said known channel coefficients of abscissa A and B, by carrying out a first iteration in which a first intermediate coefficient (of abscissa C) is calculated and by performing subsequent iterations of the same algorithm in sub-intervals defined from time to time on the right-hand by said known channel coefficient of abscissa B and on the left-hand by the intermediate coefficient derived in the preceding iteration, until the abscissa point B-1 is reached and calculated;

b) searching, by decreasing abscissas, for a first point still to be calculated on the left-hand of the last intermediate coefficient calculated; defining, as extremes of a new application interval of said interpolation algorithm, the first known left hand point and the first known right hand point with respect to said point still to be calculated; and further applying, in a recursive manner, said interpolation algorithm on said new interval, by carrying out subsequent iterations of the same algorithm in sub-intervals defined from time to time by the right hand extreme of said new interval and by a left hand extreme formed by the intermediate coefficient derived in the previous iteration, until the point immediately adjacent to the right hand extreme of said new interval is reached and calculated;

c) repeating step b) until the channel coefficient associated to the value of abscissa A+1 is calculated.

10. Method according to claim 1, wherein said channel coefficients to be calculated are comprised between two known left-hand channel coefficients, corresponding to the last two pilot symbols of a current slot (L), and two known right hand

channel coefficients, corresponding to the first two pilot symbols of a slot (L+1) subsequent to said current slot, and the computation of said channel coefficients is performed by applying the first time said interpolation algorithm for calculating an intermediate coefficient, thus dividing into two sub-intervals the interval comprised between said known left-hand channel coefficients and said known right hand channel coefficients, and by subsequently applying, in parallel, to said sub-intervals said interpolation algorithm for computing the remaining channel coefficients comprised in each of said sub-intervals.

11. Method according to claim 1, wherein at least one known point of said first or second extreme is a point which has been obtained through a linear combination of known channel coefficients.

12. Method according to any of the preceding claims, wherein said communications network is a radio mobile telecommunications network of UMTS type,

13. Device for the estimation of the transfer function of a transmission channel in a receiving system for a telecommunications network, comprising:

- a memory (100) capable of storing channel coefficients corresponding to a current slot (L) and at least one channel coefficient corresponding to a slot (L+1) subsequent to said current slot (L);

- interpolation means (104, 106, 108, 110) capable of reading from said memory (100) a first and a second operand, corresponding to known channel coefficients, and of writing into said memory (100) a value corresponding to the arithmetic average between said first and second operand, said value corresponding to a new channel coefficient;

- a logic control unit (102) for addressing in reading and writing (R/W) said memory (100) and for controlling said interpolation means (104, 106), so as to perform through

individual interpolation operations, the computation and the storage into such memory (100) of individual channel coefficients;

characterised in that said logic control unit (102) carries out a series of interpolation operations according to the method described in any of the claims from 1 to 12.

14. Radio base station, of the type comprising a Rake receiver for receiving signals coming from mobile terminals, equipped with a device for the estimation of the transfer function of a transmission channel through the computation of a plurality of channel coefficients, characterised in that said estimation of the transfer function is performed according to the method described in any of the claims from 1 to 12.

15. Mobile terminal, of the type comprising a receiver for the reception of signals coming from a radio base station, equipped with a device for the estimation of the transfer function of a transmission channel through the computation of a plurality of channel coefficients, characterised in that said estimation of the transfer function is performed according to the method described in any of the claims 1 to 12.